(19) World Intellectual Property Organization International Bureau





(43) International Publication Date 21 April 2005 (21.04.2005)

PCT

(10) International Publication Number WO 2005/036656 A1

(51) International Patent Classification⁷:

H01L 33/00

(21) International Application Number:

PCT/JP2004/015447

- (22) International Filing Date: 13 October 2004 (13.10.2004)
- (25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2003-354150 14 October 2003 (14.10.2003) JP 60/512,855 22 October 2003 (22.10.2003) US

- (71) Applicant (for all designated States except US): SHOWA DENKO K.K. [JP/JP]; 13-9, Shibadaimon 1-chome, Minato-ku, Tokyo 1058518 (JP).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): WATANABE, Munetaka [JP/JP]; c/o SHOWA DENKO K.K., 1-1, Ohnodai 1-chome, Midori-ku, Chiba-shi, Chiba 2670056 (JP).
- (74) Agents: AOKI, Atsushi et al.; A. AOKI, ISHIDA & AS-SOCIATES, Toranomon 37 Mori Bldg., 5-1, Toranomon 3-chome, Minato-ku, Tokyo 1058423 (JP).

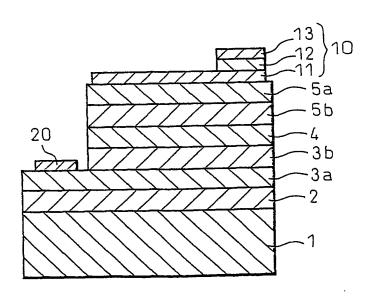
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: GALLIUM NITRIDE-BASED COMPOUND SEMICONDUCTOR LIGHT-EMITTING DEVICE, POSITIVE ELECTRODE FOR THE DEVICE, LIGHT-EMITTING DIODE AND LAMP USING THE DEVICE



(57) Abstract: An object of the present invention is to provide a flip-chip-type gallium nitride compound semiconductor light-emitting device excellent ohmic characteristics, exhibiting excellent bonding characteristics, and high The inventive flip-chip-type emission output. semiconductor nitride compound gallium light-emitting device comprises a positive electrode which has a three-layer structure comprising an ohmic electrode layer composed of rhodium which is in contact with the p-type semiconductor layer, an adhesion layer composed of titanium which is provided on the ohmic electrode layer and has a thickness of 10 A or more, and a bonding pad layer provided on the adhesion layer and being composed of a metal selected from the group consisting of gold, aluminum, nickel, and copper, or composed of an alloy containing at least one of these metals.